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(57) Abstract

A composition to be laid to form an exercise area for horses comprises a particulate material such as sand, cold or hot coated with a composition comprising granules of a plastics such as PVC coated with an oil component, e.g. bitumen plus additives, so that the laid material will be resilient and water permeable.

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EXERCISE AREAS

The invention relates to compositions for use in making exercise areas such as an arena, gallop or track, primarily for use by horses.

It is known from WO-A-86/06391 (Denehunt) to make a material to lay a horse riding surface, the material comprising a mixture of raw granulated plastics such as PVC, a bitumen emulsion and water, the granules being coated with the emulsion such that significant agglomeration is prevented. It is also known from EP-A-0231057 (En-Tout-Cas) to make for the same purpose a material comprising a synthetic polymeric material dispersed or dissolved in an oil having a viscosity such that it is substantially non-fluid at ambient temperature. The polymeric material tends to give the formed material resilience which can be increased by adding cork or rubber particles.

It is one object of the invention to provide an improved composition for the purpose. The invention is based on the realisation that if a modified composition is used, the surface formed is especially resilient and of long life because of its water permeability.

In one aspect, the invention provides a composition for admixture

with a particulate material such as sand to form the top layer of an exercise area, the composition comprising granules of a resilient granular filler coated with an oil component whereby the formed layer will be resilient and substantially water-permeable.

The composition may be applied to the particulate material either cold or heated.

The granules of the resilient granular filler component may be provided by granules of plastics; synthetic or natural rubbers, and cork or the like. Preferred are polyvinyl chloride, natural or synthetic rubber, polymers or mixtures. The granules preferably range from 1mm to about 12mm in diameter, and preferably the component comprises a mixture of granules of different sizes. The grading of the granules provides interstices between the coated granules in the top layer of the exercise area, to provide water-permeability. Often such mixtures are commercially available and they may be used directly, but a proportion of fluffy or dusty material is desirable. Also the granules should be or have a reduced moisture content. The granules may be coloured, eg green, to simulate natural turf or in other ways for aesthetic or functional purposes.

For cold coating of the particulate material, the oil composition preferably comprises a stabilised oil-in-water emulsion. The stabilised oil-in-water emulsion is preferably a bitumen or resin (or mixture) in water emulsion. Suitable bitumens will typically have a softening point in the range from about 25 to about 90. By the term stabilised we mean that the emulsion will not fully break from the time that it is made until the granules have been blended with the emulsion and the material comprising the composition and sand have been laid. This is achieved according to the invention by adding one or more additives which we will call "stabilisers". The additives selected will depend on the particular components of the emulsion, as will the concentration. In the case of a bitumen-in-water emulsion we prefer to include one or more of the following as stabilisers in concentrations by weight relative to the bitumen as shown :-

Lignin salts such as metal salts, about 0.5%

Rosin derivatives such as acidic rosin derivatives about 1.0%

Other stabilisers are the substances known as Tecpol and Polyfon H.

The proportion of oil in the emulsion may range from about 30% to

about 65% by weight. If less than the minimum is used, then a thick enough coating is unlikely to be produced in which case the break time may be too long owing to the presence of relatively excess water and the material may not bind satisfactorily. If the upper limit is exceeded a too thick and uneven coating may result with the possibility of too quick a break. This would give an inconsistent product which would be very difficult to lay in the normal way ie even distribution over the area to be treated by raking.

The granules and the bitumen-in-water emulsion may be mixed in a weight proportion of about 16 to about 6:1 for a 40% oil in water emulsion. Varying the emulsion content will produce similar effects to varying the oil content of the emulsion as described above. Preferably, the granular filler component makes up about 90% by weight of the composition.

The stabilised oil-in-water emulsions are anionic. Emulsions which are cationic could be used but it is difficult to control the break time and to set with an even film of the bitumen on the granules.

The stabilised emulsion and the granules may be mixed in a variety of ways. While the emulsion and granules may be mixed on site using for example a paddle mixer, it is a much preferred

feature of the invention that they are mixed together in a Pugmill type mixer such as an asphalt mixer or like equipment. The product when the emulsion is only partially broken is a free flowing mix which may be transported from the site of manufacture to the place of use and then be laid without further treatment. When the emulsion breaks the product is flexible and resilient.

The stabilised emulsion may include additives such as reinforcing fibres eg polypropylene, asphaltite, pigments, fillers or the like. It is an important feature of the product that it binds well under compaction yet is resilient with good elastic recovery when the compacting force is removed. In order to enhance this the oil component of the emulsion may be modified by the addition or rubber or polymer, or a latex or mixture of lattices or rubber or polymer in water emulsions may be added to the emulsion and incorporated by mixing, or added to the composition whilst it is being mixed. A suitable proportion of bitumen emulsion to polymer emulsion would be about 13:1.

One advantage of the compositions just defined is that they can be laid cold but of course the composition and the particulate material can be laid warm if required.

The particulate material may be coated hot using another oil composition of the invention, the composition comprising the

granular material, a bitumen or resin binder and an asphaltite.

The composition just defined preferably includes natural gilsonite as the asphaltite because this is a powder which is readily mixable. The presence of this ingredient increases the overall life of the material by absorbing ultraviolet light. It tends to harden with time and so counteracts a tendency of other ingredients to soften with time. The concentration of the asphaltite tends to be low, about say 0.5 to about 1.5% by weight of the total composition. If less than this is used then such softening may occur while an upper limit is determined by cost and the effect on the binder.

The bitumen or resin binder will be selected according to the amient conditions. A bitumen having a penetration value of between about 50 and 100 when measured by the BS2000 Part 49 method is suitable in Britain; different values may be better for warmer climates.

Most preferably, the composition includes one or more latices. The latex provides elasticity and flexibility in the formed product. it also tends to prevent embrittlement at low temperatures. A mixture of latexes, natural and synthetic, may be used. It also tends to limit movement under high temperature.

Waxes, and fillers may be present to reduce tack and for like effects. Reinforcing fibres may be present.

When mixed with the hot particulate material eg sand, the granular material preferably makes up the bulk of the formed mass. In our evaluations we have found it preferable to use a composition comprising (by weight)

particulate filler eg sand	100
granular filler (graded)	150
bitumen	10
asphaltite	3

The particulate filler is preferably a sand, preferably one having round grains so that there are no sharp corners to harm horses. Other particulate fillers may be used.

An area of the composition of the invention may be laid on a suitable substrate. While the substrate may be prepared in a variety of ways, we prefer to cut the substrate eg soil, apply a geotextile membrane, followed by a 13cm layer of graded limestone, then a 5cm layer of open textured bitumen based macadam, and then at least 15cm of the composition of the invention is applied cold or with heat. The area may then be raked or rolled to provide the exercise surface. The formed area

has a number of advantages. Firstly, it is resilient, in the sense that natural turf is, so that it is an excellent surface for exercising horses. Secondly it has little or no tendency to suffer from tracking, ie for permanent tracks to be formed as a result of regular use. The area is suitable for all weather use, being water and rain permeable. If any tracking or deformation does occur the area can be remedied very easily by harrowing or raking and rolling.

A horse track or other substitute soil material when made by mixing sand or other particulate material with a composition of this invention is resilient and water permeable irrespective of whether the oil component of the composition is a stabilised oil-in-water emulsion or a bitumen and asphaltite mixture. The granules of the granular filler provide resilience; this is enhanced in the case of the stabilised oil-in-water emulsion by the flexibility of the binder system thereof and in the case of the bitumen/asphaltite mixture by additives such as latices. The water permeability in both cases is caused by the grading of the granular filler and the binder content. The inclusion of an asphaltite such as gilsonite to both types of oil component extends the life of the laid material.

The invention includes a resilient water permeable mass comprising a particulate material mixed with a composition

comprising granules of a granular filler coated with an oil component whereby the mass is resilient and water permeable.

The invention further includes a method of applying such as mass to form an exercise area.

In another aspect the invention provides a resilient flexible water permeable mass which is the blended product of a particulate material and a composition comprising a resilient granular filler component and a stabilised oil-in-water emulsion component. In another prefered aspect, the invention provides a method of making such a composition comprising blending a resilient granular filler component in such a way as to blend the filler granules therein and then allowing or causing the emulsion to break.

In another preferred aspect, the invention provides a resilient water permeable mass which is the blended product of a resilient granular filler component and a composition comprising bitumen or resin binder and an asphaltite.

In order that the invention may be well understood it will now be described by way of illustration only, with reference to the following examples, in which parts are by weight.

Example I

Bitumen of softening point 50°C is mixed with water and the following additives to form a stabilised bitumen-in-water emulsion, in the following proportions :

Ingredient	Proportion
bitumen	38.00
water	57.47
polymer (added as polymer in water latex)	3.00
rosin acid derivatives	0.70
lignin metal salts	0.80
sodium hydroxide	0.03

A mixture of polyvinyl chloride average granule size of 1mm to 12mm diameter was mixed with the stabilised emulsion and gilsonite in a paddle mixer in a weight proportion of 87:12:1 The mixer was run for 2 minutes. The granules were blended in the emulsion which partially broke, and the resultant composition took the form of a flexible mass. A substrate was prepared by consolidating the ground, laying a plastics liner, and applying 12cm of graded limestone and 5cm of open texture bitumen based macadam coarse. The mass was laid to a depth of about 15cm,

rolled and raked. The track formed was used to exercise horses. It was noted that the surface layer was resilient and the horses exercised well. There was little or no tracking. Droppings falling on the track were easily removed. The surface was freshened by rolling or raking.

Example II

A resilient water permeable mass was made by mixing in the cold sand particles with composition comprising :-

polyvinyl chloride particles (graded)	87.0
bitumen (penetration point of 200)	7.0
water	4.0
limestone filler	1.0
long chain amines	0.5
synthetic wax	0.5

until the sand particles were coated. The mass was used to lay a horse exercise track which was resilient and water permeable.

EXAMPLE III

A resilient water permeable mass made by coating sand particles in the cold with a composition comprising :-

polyvinylchloride particles (graded)	87.5
bitumen (penetration point of 100)	7.0
water	4.0
gilsonite	1.0
polypropylene fibres	0.5

until the sand particles were well coated. The mass was used to lay a horse exercise track.

Example IV

Concentrate

water	23.18
gilsonite	21.50
limestone powder	20.00
waxes (high melting point Arude wax)	20.00
latexes	6.40
long chain amines	5.00
antioxidant (such as the dilauryl salt of B, B^1 thiodipropionic acid)	2.00
Vinsol NVX	0.88
Indulin C, the sodium salt of	

lignum	0.44
Proxil AB (aqueous dispersion of 1,2 - benzisothiazolin-3-one)	0.30
caustic soda	0.30
	100.00

36.5 parts sand were heated and added to a mixer with 3.5 parts bitumen. 5.5 parts of the concentrate were added and well mixed followed by 55 parts of waste pvc granules (graded mix). The whole was well mixed until the sand grains were evenly coated. The formed mass was resiliently flexible and removed from the mixer. The material could then be used directly to form the equitation surface. A substrate was prepared by consolidating the ground, laying a plastics liner, and applying 12cm of graded limestone and 5cm of open texture bitumen based macadam coarse. The mass prepared as above was laid to a depth of about 15cm, rolled and raked. The track formed was used to exercise horses. It was noted that the surface layer was resilient and the horses exercised well without material sticking to their hooves. There was little or no tracking. Droppings falling on the track were easily removed. The surface was freshened by rolling or raking.

Example V

Sand particles (30 parts) were heated and added to a mixer followed by a mixture of the following while maintaining the heat

polyvinylchloride graded granules	54.0
limestone dust	10.0
bitumen (penetration point of 50)	5.0
gilsonite	1.0

until the sand particles were evenly coated to form a resilient flexible water permeable mass.

EXAMPLE VI

Sand particles (32.75 parts) were heated and add to a mixer followed by :-

waste polyvinylchloride graded granules (graded)	60.0
bitumen (penetration point of 100)	4.0
cement filler	2.0
asphaltite	1.0
long chain amine	0.25

The mixing was continued until the sand particles were evenly coated to form a resilient flexible water-permeable mass.

CLAIMS

1. A composition for admixture with a particulate material such as sand to form the top layer of an exercise area wherein the composition comprises the granules of a resilient granular filler coated with an oil component whereby the formed layer will be resilient and substantially water-permeable.

2. A composition according to Claim 1, wherein the granules of the granular filler are of plastics, rubber, cork or the like.

3. A composition according to Claim 1 or 2, wherein the granular filler comprises a graded mixture of granules.

4. A composition according to any preceding Claim, wherein the granules range from about 1 mm to about 12 mm in diameter.

5. A composition according to any preceding Claim, wherein the granules are of polyvinyl chloride.

6. A composition according to any preceding Claim, wherein

the oil component is a stabilised oil-in-water emulsion.

7. A composition according to Claim 6, wherein the oil-in-water emulsion is a stabilised bitumen-in-water emulsion.

8. A composition according to Claim 7, wherein the bitumen has a softening point in the range of about 25 to about 90.

9. A composition according to any of Claims 6 to 8, wherein the emulsion contains a stabiliser which is a lignin salt in a concentration of about 0.5%.

10. A composition according to any of Claims 6 to 9, wherein the emulsion contains a stabiliser which is a rosin derivative in a concentration of about 1% by weight.

11. A composition according to any of Claims 6 to 10, wherein the proportion of oil in the emulsion is from about 30% to about 65% by weight.

12. A composition according to any of Claims 6 to 11, wherein the granules are mixed with the emulsion in a weight ratio of about 16 to about 6:1.

13. A composition according to Claim 12, wherein the granules and the emulsion are mixed without the application of heat.

14. A composition according to any of Claims 6 to 13, wherein the stabilised oil-in-water emulsion is anionic.

15. A composition according to any of Claims 6 to 14, wherein the stabilised oil-in-water emulsion contains rubber or polymer or lattices in sufficient quantity to enhance resilience.

16. A composition according to any of Claims 6 to 15, wherein the stabilised oil-in-water emulsion contains fibres, asphaltite, fillers or the like.

17. A composition according to any of Claims 6 to 16, wherein the oil component comprises a bitumen or resin binder and asphaltite.

18. A composition according to Claim 17, wherein the asphaltite is gilsonite.

19. A composition according to Claim 17 or 18, wherein the asphaltite comprises about 0.5 to about 1.5% by weight of

the composition.

20. A composition according to any of Claims 17 to 19, wherein the oil component contains lattices.

21. A composition according to any of Claims 17 to 20, wherein the oil component contains waxes, fillers or fibres.

22. A composition according to any of Claims 17 to 21, wherein the composition is mixed with the particulate material with the application of heat.

23. A composition according to Claim 22, comprising substantially:

particulate material	100
granular filler	150
bitumen	10
asphaltite	3

24. A composition for admixture with a particulate material such as sand, substantially as described with reference to the Examples.

25. A method of laying an exercise area comprising mixing a particulate material with a composition according to any

preceding Claim and applying the mixed material in a layer at least 15 cm thick.

26. A method according to Claim 25, wherein a substrate is first cut, a geotextile membrane is applied followed by graded limestone and then a bitumen based macadam.

27. A resilient water permeable mass comprising a particulate material mixed with a composition comprising granules of a granular filler coated with an oil component whereby the mass is resilient and water-permeable.

28. A mass according to Claim 27, wherein the oil component comprises a stabilised oil-in-water emulsion.

29. A mass according to Claim 27, wherein the oil component comprises a bitumen or rubber binder and an asphaltite.

30. An anionic oil-in-water emulsion wherein stabilisers are present.

31. An emulsion according to Claim 30, wherein the stabilisers are lignin salts and acidic rosin derivatives.

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 89/00115

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[4]: C 09 K 17/00; E 01 C 13/00

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[4]	C 09 K; C 08 J

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	FR, A, 605699 (W. CALDERWOOD) 31 May 1926, see page 1, lines 1-27; abstract points 1,2 --	1
X	Soviet Inventions Illustrated, week 8717, 6 May 1987, abstract no. 87-120631/17, Derwent Publications Ltd (London, GB), & SU, A, 1253982 (Bashkir Univ (Ufap Nady=) 30 August 1986, see the whole abstract --	1
X	GB, A, 435324 (C. ARLIDGE) 17 October 1935, see page 1, lines 63-66,73-81; page 2, lines 1-23,51-60; claims 1-4,7 --	1-3
X	US, A, 3708319 (K.H. NIMERICK) 2 January 1973, see column 2, lines 54-65; column 3, lines 14-17; column 4, lines 1-3; claims 1-11 --	1,2,6
X	EP, A, 0231057 (EN-TOUT-CAS PLC) 5 August ./.	1,2,3,7,15, 24,25,26

* Special categories of cited documents: [10]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
26th May 1989	20 JUN 1989
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	P.C.G. VAN DER PUTTEN

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
	1987, see page 1, lines 1-6; page 2, lines 20-24; page 3, lines 1-4,11-22; page 4, lines 5-11,22-25; page 5, lines 1-4; page 6, lines 4-7,19-25; claims 1-15 cited in the application --	
X	WO, A, 86/06391 (DENEHUNT) 6 November 1986, see page 1, lines 18-33; page 2; page 4, lines 11,12,25-27; claims 1,4 cited in the application ----	1,2,3,5,7

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. GB 8900115 SA 26826

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 14/06/89
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A- 605699		None	
GB-A- 435324		None	
US-A- 3708319	02-01-73	None	
EP-A- 0231057	05-08-87	AU-A- 6754187	16-07-87
		GB-A- 2185490	22-07-87
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